was very dry. At Staunton and Stanardsville, Va., the month | Cal., the month was very dry; no rain falling. driest November in 5 years. At Charleston, Ill., the ground unable to plow. was very dry, and water scarce in creeks and wells. At Shreveport, La., the drought was broken on the 9th. At Fort Madison, Iowa, the month was very dry, and water for stock and creeks were dry. At Red Bluff, Cal., rain was needed, 17th prairie fires destroyed hay and grain south of Fort Pemthe drought becoming severe by the 25th. At Grass Valley, bina, N. Dak.

was unusually dry. At Woodbury, N. J., the month was the Minnville, Oregon, the month was so dry that farmers were

O PRAIRIE FIRES.

Near Webster, S. Dak., hundreds of tons of hay were descarce. At Fayette, Mo., no rain fell after the 17th, and ponds stroyed by prairie fires from the 1st to 4th. On the 16th and

Q VERIFICATIONS.

FORECASTS FOR 24 HOURS IN ADVANCE.

November, 1890, were made by Assistant Professor H. A. Hazen, Signal Service, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant John P. Finley, Signal Corps.

Percentages of forecasts verified, November, 1890.

States.	States.						
Maine New Hampshire Vermont Massachusetts Rhode Island Connecticut Eastern New York Western New York Eastern Pennsylvania Western Pennsylvania Western Pennsylvania Oistrict of Columbia Virginia North Carolina South Carolina Georgia Eastern Florida Alabama Mississippl Louisiana Texas Arkansas Tennessee	82-4 81-5 81-5 81-5 85-9 85-7 85-7 85-7 89-9 88-4 88-1 90-4 90-4 90-2 90-2 90-2 85-9 85-9 85-9 85-9 85-9 85-9 85-9 85-9	Kentucky Ohio West Virginia Indiana Illinois Lower Michigan Upper Michigan Wisconsin Minnesota Iowa Kansas Nebraska Missouri Colorad, North Dakota. South Pakota. Southern California* Oregon* Washington* Ey elements: Weather. Temperature! Monthly percentage of weather and temperature combined ‡	85.0 79.1 85.5 87.9 98.1 85.5 87.9 98.5 88.9 98.5 88.9 94.3 85.7 95.9 88.8 88.8 88.8 88.4 86.2				

•In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The forecasts of temperature in districts east of the Rocky Mountains for November, 1850, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. † The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

FORECASTS FOR 48 AND 72 HOURS IN ADVANCE. Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for 48 and 72 hours, covering the 2d and 3d days in advance. These are optional with the forecast official, and are only made when clearly in the public

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. | interest, and cover, in all cases, considerable areas of country, E. Williams, chief clerk of the Forecast Division.] | interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day The forecasts for districts east of the Rocky Mountains for in advance. Number of predictions made: weather, 254; temperature, 78. Percentages of verifications: weather, 94.6; temperature, 86.7; weather and temperature combined, 93.3.

Percentages of verifications of forecasts made for third day in advance. Number of predictions made: weather, 12; temperature, 7. Percentages of verifications: weather, 95.0; temperature, 18.6; weather and temperature combined, 73.6.

NO WIND SIGNALS FOR NOVEMBER, 1890.

Statement showing percentages of justifications of wind signals for the month of November, 1890:

Wind signals.—(Ordered by Assistant Prof. H. A. Hazen). Total number ordered, 106; justified as to velocity, wholly, 79, partly, 3; justified as to direction, 99. Of the signals ordered 99 were cautionary, of which 74 were wholly, and 1 partly justified; and 7 were storm signals, of which 5 were wholly, and 2 partly justified. 21 signals were ordered for easterly winds, of which 16 were justified, and 85 were ordered for westerly winds, of which 83 were justified. Percentage of justifications, 69.9.

COLD-WAVE SIGNALS AND TEMPERATURE FALL WARNINGS. [Ordered by Assistant Prof. T. Russell.]

Number of cold-wave signals ordered, 60; justified, 16. Percentage of justifications, 26.7. Number of temperature fall warnings, 6. Percentage of justifications, 100. Percentage of justifications of cold-wave signals and temperature fall warnings combined, 30.2.

Percentages of verifications of weather and temperature signals reported by directors of the various State Weather Services for November, 1890.

States.	Weather.	Tem- perature.	States.	Weather.	Tem- perature.
Iowa	95	94	Nebraska	35	92
Illinois	87	81	New Jersey		83
Kansas	84	90	North and Bouth Dakota		87
Michigan	90	90	Ohio		93
Minnesota	86	76	Pennsylvania		87

STATE WEATHER SERVICES.

[Temperature in degrees Pahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts and summaries are republished from reports for November, 1890, of the directors of the various state weather services:

ALABAMA.

Temperature.—The mean was 4.4 above the normal; maximum, 85, at Citronelle, 1st and 12th; minimum, 23, at Valley Head, 1st and 4th; greatest monthly range, 59, at Valley Head; least monthly range, 39, at Union Springs.

Precipitation.—The average was 8.25 below the normal; greatest monthly 1.79, at Uniontown; least monthly, 0.00, at Bermuda and Columbiana.

Wind.—Prevailing direction, northwest.—Prof. P. H. Mell, Auburn, director; J. M. Quarles, Private, Signal Corps, assistant.

sellville, 12th; minimum, 25, at Devall's Bluff, 27th; greatest monthly range, 54, at Russellville and Lead Hill; least monthly range, 38, at Ozone.

Precipitation.—The average was about the normal for the last 8 years; greatest monthly, 7.10, at Harrisburgh; least monthly, 2.85, at Camden.—M. F. Locke, Commissioner of Agriculture, Little Rock, director; F. H. Clarke, Sergent Singl Corps. assistant. Sergeant, Signal Corps, assistant.

79, at Uniontown; least monthly, 0.00, at Bermuda and Columbiana.

Wind.—Prevailing direction, northwest.—Prof. P. H. Mell, Auburn, dictor; J. M. Quarles, Private, Signal Corps, assistant.

Temperature.—The mean was 8.5 above the normal; maximum, 88, at River Bend, 17th; minimum, —20, at Breckenridge, 15th; greatest monthly range, 100, at Breckenridge; least monthly range, 80, at Kit Carson.

Precipitation.—The average was 0.20 below the normal; greatest monthly, 2.70, at Cumbres; least monthly, 0.00, at a number of stations.

Wind.—Prevailing direction, west.—W. S. Miller, Sergeant, Signal Corps,

Colorado Springs, assistant.

ILLINOIS.

Temperature.—The mean was 4.1 above the normal of the last 15 years; maximum, 78, at Rushville, 5th; minimum, 18, at Sycamore, 26th.

Precipitation.—The average was 1.09 below the normal of the last 15 years;

greatest monthly, 7.35, at Golconda; least monthly, 0.25, at Mattoon.

Wind.—Prevailing direction, northwest.—John Craig, Sergeant, Signal

Corps, Springfield. in charge.

Temperature.—Maximum, 75, at Cannelton, 7th; minimum. 14, at Point Isabel, 28th; greatest monthly range, 52, at Vevay; least monthly range, 88,

Precipitation.—Greatest monthly, 5.78, at Mount Vernon; least monthly,

1.10, at Shelbyville.

Wind. - Prevailing direction, southwest. - Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhaus, Sergeant, Signal Corps, assistant.

O IOWA WEATHER AND CROP SERVICE.

Temperature. - The mean was 5 above the normal; maximum, 78, at Blakeremperature.—The mean was observed and that, maximum, 70, at Blakewille, 5th; minimum, —2, at Stilson, 7th; greatest monthly range, 62, at Blakewille; least monthly range, 36. at Independence and Dubuque.

Precipitation.—Greatest monthly, 3.55, at Hampton; least monthly, 0.71,

Wind .- Prevailing direction, northwest .- J. R. Sage, Des Moines, director; G. M. Chappel, Sergeant, Signal Corps, assistant.

Temperature.—The mean was above the normal; maximum, 84, at Lincoln, 4th, and at Shields, 5th; minimum, 9, at Lakin, 10th; greatest monthly range, 71, at Lakin; least monthly range, 44, at Lawrence and Collyer.

Precipitation.—Greatest monthly, 4.42, at Sedan; least monthly, 0.02, at

Wind .- Prevailing direction, north. - Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.

() KENTUCKY.

Temperature.—The mean was about 4 above the normal; maximum, 81, at Franklin, 9th; minimum, 19, at Harrodsburgh, 29th; greatest monthly range, 58, at Harrodsburgh; least monthly range, 44, at Central City.

Precipitation.—The average was about 1.00 above the normal; greatest

monthly, 7.70, at Princeton; least monthly, 2.90, at Caddo.

Wind.—Prevailing direction, southwest.—Dr. E. A. Grant, Louisville, director; Frank Burke, Sergeant, Signal Corps, assistant.

LOUISIANA.

Temperature.—Maximum, 88, at Cameron, 6th; minimum, 24, at Plaquemine, 4th; greatest monthly range, 60, at Cheneyville; least monthly range, 30, at Port Eads.

Precipitation.—Greatest monthly, 7.46, at Cheneyville; least monthly, 0.28,

at Edgard.

Wind.—Prevailing direction, north.—George E. Hunt, Sergeant, Signal Corps, New Orleans, in charge.

MICHIGAN.

Temperature.—The mean was 1.8 above the normal of 15 years; maximum, 70, at Highland Station, 9th; minimum, 11, at Highland Station, North Marshall, and Ypsilanti, 28th; greatest monthly range, 59, at Highland Station; least monthly range, 27, at Atlantic.

Precipitation.—The average was 0.64 below the normal for 15 years; greatest monthly, 4.30, at Stanton; least monthly, 0.68, at Crystal Falls and

Gladwin.

Wind .- Prevailing direction, southwest .- N. B. Conger, Sergeant, Signal

Corps, Lansing, director.

MINNESOTA.

Temperature.—The mean was about 6 above the normal; maximum, 69, at Montevideo, 20th; minimum, —7, at Pine River Dam and Pokegama Falls, 8th; greatest monthly range, 67, at Pine River Dam; least monthly range, 39, at Duluth.

Precipitation. - Greatest monthly, 1.24, at La Crosse, Wis.; least monthly,

O. 17, at Crookston.

Wind .- Prevailing direction, northwest-John Healy, Corporal, Signal Wind.—Prevening Corps, Minneapolis, in charge.

MISSOURI.

Temperature. - Maximum, 80, at Fayette and Protem; minimum, 20, at Steelville.

Precipitation.—Greatest monthly, 6.08, at Cairo, Ill.; least monthly, 0.18, at Laddonia.—Prof. Francis E. Nipher, Saint Louis, director.

NEBRASKA.

NEBRASKA.

Temperature.—Maximum 79, at O'Neill; minimum, 1, at Valentine.

Precipitation.—The southeast part of the state had a little more than its average rainfall, ranging from 1.00 to 2.00; throughout the remainder of the state the precipitation was less than 1.00, and generally less than 0.50—Prof.

Goodwin D. Swezey, Crete, director; G. A. Loveland, Sergeant, Signal Corps, assistant.

NEVADA.

Temperature.—Maximum, 86, at El Dorado Canyon, 4th; minimum, 5, at Pioche, 9th and 12th; greatest monthly range, 71, at Tybo; least monthly range, 40, at El Dorado Canyon.

Precipitation. - Greatest monthly, 1.41, at El Dorado Canyon; least

monthly, trace, at Hot Springs and Downeyville.

Wind.—Prevailing direction, northwest.—Prof. Charles W. Friend, Carson City, director; D. C. Grunow, Corporal, Signal Corps, assistant.

ONEW ENGLAND METEOROLOGICAL SOCIETY.

Temperature.—The mean was normal; maximum, 71, at Groton (b), 6th, and Taunton (d), 8th; minimum, 2, at Berlin Mills and Berlin Falls, 28th; greatest monthly range, 62, at Lake Cochituate and Taunton (d); least monthly range, 35, at Nantucket.

Irecipitation.—The average was 2.59 below the normal; greatest monthly, 3.66, at West Milan; least monthly, 0.55, at Lake Konomoc.

Wind.—Prevailing direction, northwest.—Prof. William H. Niles, Boston, Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; J. Warren Smith, Private, Signal Corps, assistant.

NEW JERSEY.

Temperature.—The mean was 1.7 above the normal; maximum, 74, at Beverly, 8th; minimum, 11, at Freehold, 28th; greatest monthly range, 58, at Egg Harbor City, Atlantic City, and Freehold; least monthly range, 40, at Lambertville.

Precipitation.—The average was 2.60 below the normal; greatest monthly,

1.10, at Trenton; least monthly, 0.38, at Atlantic City.

Wind.—Prevailing direction, northwest.—E. W. McGann, Sergeant, Signal Corps, New Brunswick, in charge.

Temperature.—Maximum, 71, at Middleburgh, 6th, and New York City, 8th; minimum, 2, at Utica, 24th; greatest monthly range, 65, at Middleburgh; least monthly range, 87, at Fort Porter.

Precipitation—Greatest monthly 2.4

Precipitation.—Greatest monthly, 6.41, at Sand Bank; least monthly, 0.41,

at Addison.

Wind.—Prevailing directions, northwest and southwest.—Prof. E. A. Fuertes, Ithuca, director; R. M. Hardinge, Private, Signal Corps, assistant.

NORTH CAROLINA.

It was the driest November on record.

Temperature. The mean was 2.5 above the normal; maximum, 85, at Chapel Hill, 11th; minimum, 12, at Franklin, 28th; greatest monthly range,

72, at Franklin; least monthly range, 34, at Hatteras.

Precipitation.—The average was 3.75 below the normal; greatest monthly, 1.91, at Highlands; least monthly, 0.00, at Franklin.

Wind.—Prevailing direction, southwest.—Dr. Herbert B. Battle, Raleigh, director; C. F. von Herrmann, Sergeant, Signal Corps. assistant.

NORTH AND SOUTH DAKOTA.

Temperature.—The mean was 6.2 above the normal; maximum, 78, at Millbank, S. Dak., 20th; minimum, -6, at Woonsocket, S. Dak., 10th; greatest monthly range, 75, at Woonsocket, S. Dak.; least monthly range, 42, at De Smet, S. Dak.

Precipitation.—The average was about 0.26 below the normal; greatest monthly, 3.20, at Webster, S. Dak.; least monthly, 0.03, at Fort Buford, N. Dak. Wind.—Prevailing direction, northwest.—S. W. Glenn, Sergeant, Signal Corps, Huron, S. Dak., in charge.

QHIO. Temperature.—The mean was 2.9 above the normal, and the mean tem-

Portsmouth, 17th; himimum, 17, at Wausson, 28th.

Precipitation.—The average was 0.52 below the normal; monthly snowfall varied from trace, at Pomeroy, to 3.5, at Jefferson.—Prof. B. F. Thomas, Columbus, director; C. M. Strong, Sergeant, Signal Corps, secretary and assistant.

OREGON.

The characteristics of the month were the excess in temperature and deficiency in precipitation.

Temperature.—The mean was 2.0 above the normal; maximum, 75, at Grant's Pass and Lakeview, 2d; minimum, 7, at North Powder, 15th.

Precipitation.—The average was nearly 4.00 below the normal; greatest monthly, 1.87, at Astoria; least monthly, 0.00, at many stations.

Wind.—Prevailing direction, north.—Hon. H. E. Hayes, Master State Grange, Oswego, director; B. S. Pague, Sergeant, Signal Corps, assistant.

PENNSYLVANIA.

Temperature.—The mean was 2° above the normal; maximum, 78, at Uniontown, 7th; minimum, 10, at Wilkes Barre, 29th; greatest monthly range, 58, at Charlesville; least monthly range, 42, at Catawissa, Harrisburg, Selin's Grove, and Eagle's Mere.

Precipitation.—The average was 2.00 below the normal; greatest monthly,

4.29, at Columbus; least monthly, 0.78, at Blue Knob.

Wind.—Prevailing direction, west.—Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant.

OTENNESSEE.

The mean temperature was the highest and the precipitation the least reported for November in the last 8 years

Temperature. - Maximum, 81, at Springdale, 12th; minimum, 19, at Springdale, 28th; greatest monthly range, 62, at Springdale; least monthly range, 42, at Union City.

Precipitation.—Greatest monthly, 6.49, at Covington; least monthly, 0.00,

at Parkersville and Dare.

Wind.—Prevailing directions, north and west.—J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.

TEXAS.

Temperature.—Maximum, Q0, at Gallinas. 8th; minimum, 14, at Coldwater, 10th; greatest monthly range, 63, at Coldwater; least monthly range, 29, at La Grange.

Precipitation.—Greatest monthly, 5.27, at Weatherford; least monthly, 0.00, at La Grange.—D. D. Bryan, Galveston, director; I. M. Cline, Sergeant, Signal Corps, assistant.

WISCONSIN.

Temperature.—The meal was over 3 above the normal; maximum, 70, at Hayward, 20th; minimum, 7, at Hayward, 8th, and at Red Wing, Minn., 10th; greatest monthly range, 63, at Hayward; least monthly range, 26, at Cadiz.

Precipitation.—The average was slightly below the normal; greatest monthly

2.98, at Delavan; least monthly, 0.38, at Saint Paul, Minn.

Wind.—Prevailing direction, northwest.—R. E. Kerkam, Milwaukee,

Sergeant, Signal Corps, in charge.

NOTES AND EXTRACTS.

O EVAPORATION.

[By Assistant Professor T. Russell.]

In Table I are given depths of evaporation for the months, in inches, as measured by a pan evaporometer and by a Piche evaporometer, at Sweetwater Dam, San Diego Co., Cal. The results are communicated by John E. Boal, voluntary observer. The results with the Piche were derived by taking the quantity of water evaporating from a wetted paper surface as one and onethird of the evaporation from an equal water surface. The evaporation from the pan, as shown by the table, is 1.12 times the evaporation given by the Piche. It may be concluded from this that in the long run, in the course of a year, the Piche gives a good approximation to the actual evaporation taking place.

In Table II are given the depths of evaporation observed at a number of

stations in 1889 and 1890 with Piche evaporometers.

In Tables III and IV are given depths of evaporation measured by pans. These values have been courteously communicated by the Hon. J. W. Powell, director of the U.S. Geological Survey.

TABLE I.—Comparison (in inches) of evaporation from a pan and as measured with a Piche evaporometer at Sweetwater Dam, San Diego Co., Cal.

	181	В9.	189	90.	
Month.	Pan.	Piche.	Pan.	Piche.	
January February March May January May January May January Jan	8. 22 7. 26 7. 81 4. 52		1.91 1.80 3.28 5.50 7.87 6.48 5.49	2-49 2-91 4-40 3-92 4-86 5-31 5-99	
Sums	32.72 1.16	28.22	32·33 1·08	29.8	

Table II .- Evaporation (in inches) measured by Piche evaporometer.

	1899. 1890.								
Place.		July.	August.	September.	June.	July.	Angust.	September.	
Boston, Mass. New York City Washington City Buffalo, N. Y. Cincinnati, Ohio Memphis, Tenn. New Orleans, La. Chicago, Ill. Seier, Cal. Yuma, Ariz. El Paso, Tex. Dodge City, Kans. San Antonio, Tex. Omaha, Nebr. Denver, Colo. Baint Vincent, Minn. Helena, Mont. Bolsé City, Idaho. Albuquerque, N. Mex.	3.6.52.7.6.8.5.0.1.0.1.38.0.4.5.0.1.0.1.38.0.4.5.0.1.0.1.38.0.4	3·59 3·95 3·95 3·95 4·27 4·42 14·13 16·32 3·66 9·88 10·98	3.44 3.84 4.5 4.99 5.01 117.75 117.75 11.09 10.09 10.00 1	3.0 2.7 3.6 4.1 4.4 9.4 4.9 8.8 8.9 1.5.2 6.2 7.4 8.4 4.5	4.8 5.6 3.0 3.8 7.0 11.6 3.3	5·4 4·5 4·7 5·9 16.3	4.7 3.6 3.9 4.7 	3.1 2.6 2.8 3.2	

Table III.—Evaporation (in inches) measured with pan in 1889.

Place.	January.	February.	March.	April.	May.	June.	July.	August.	September	Осторет.	November.	December.
Bozeman, Mont												
City), Utah			7.6			3.9 8.1	5. o 7. 9	4.6 8.6 7.1	2.9 6.2 7.2	4·2 3·6	2.6	2.
Fort Bliss (El Paso), Tex. Tempe, Aris					10.9	10.7	9.6	11.4	9.2	6.8	4.6	2.
Tuolumne (Meado's), Cal Lake Tenaigo, Cal Little Yosemite, Cal Provo City, Utah									5·9 5·7 7·2	3.3		

Table IV.—Evaporation (in inches) measured with pan in 1890.

Place.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Bozeman, Mont			l	<u> </u>		2.6	ļ	l <i>.</i>				
Fort Douglass (Salt Lake City), Utah.				3.7	4. I		7.4	6.5	4.6		1.2	
Canon City, Colo			3.8	4.8	5-3	7.3	6.0		.			ļ
Fort Bliss (El Paso), Tex.	2.0	2.0	7.0	7.3	10.8	11.7	9.5	7.6			3.7	
Tomve Ariz	 	 		5.8	5.5	5.6	6.6	11.5	5.8	5.2		ļ
Florence, Ariz			5.8	8.2	11.5	13.5						
Yuma, Ariz	2.0	2 8	<u> </u>	<u>i</u>	<u> </u>	7.2	8.5	7.2	7.0	}	····	·····

Meteorological record of Army post surgeons, voluntary, and other co-overating observers, November, 1890.

Stations.	Temperature. (Fahrenheit.)			ip'e.	Stations.	Ter (Fa	į		
	Max.	Min.	Mean.	Precip'n.	Swelldis.	Max.	Min.	Mean	Precip'n
Alabama. Bermuda *† Citronelle. Columbiana † Decatur (1) † Decatur (2) † Double Bprings † Evergreen † Fort Deposit. Greensborough Livingston(1) * Livingston(2) † Marion † Mt. Vernon B'ks. Opelika † Selma(2) † Tuscumbia (1) Tuscumbia (1) Tuscumbia (2) Union Springs Uniontown Valley Head † Alaska. Juneau. Killisnoo Arizona. Antelope Valley	60 47	30 32 25 23 28 36 28 30 32 27 28 29 27 28 29 26 39 31 23 30 32 30 32 30 32 30 30 30 30 30 30 30 30 30 30 30 30 30	56.4 63.6 56.0 53.8 460.7 59.6 59.6 59.6 59.6 59.6 59.8 57.6 59.8 57.6 59.8 57.6 59.8 59.9 57.9 59.9 59.9 59.9 59.9 59.9 59.9	Ins. T. 1.40 0.00 0.18 1.10 0.05 0.05 0.09 0.00 0.50 0.00 0.50 0.5	Arizona—Cont'd. Benson Bisbee†* Calabasas Casa Grande Chino Chiri Cahua M't's Cottonwood Dragoon † Dragoon Summit Dos Cabezos † Farley's Camp Fort Apache Fort Bowie Fort Grant Fort Huachuca Fort Huachuca Fort Huachuca Hotlorook † Lochiel* Maricopa Mineral Park m. Mount Huachuca Natural Bridgef New River†	79 78 72 77 98 82 83 72 74 80	40	53.7 49.6 68.1 43.3 55.2 56.6 45.5 50.2 55.2 56.0 66.0 65.8 49.3	7.88 0.50 0.77 1.77 3.88 0.60 0.42 2.66 0.11 1.60 0.60 0.60 0.60 0.60 0.60 0
Aris. Canal Co. Dam.	93	39	62.4	1.85	Oro		.1		ō.